

Allied Laser Spectrum

Oxygen Regulator Servicing & Testing

WARNING

The information contained below is only for the use of trained technicians, we will not sell or supply spare parts to untrained persons.

High Pressure Oxygen is DANGEROUS.

Medical equipment must only be serviced by trained people certified on the equipment they are servicing using approved special tools and test devices.

If you have an item that needs repair call us to make the necessary arrangements and put you in contact with a local service agent.

Laser Spectrum Regulator

Type 1 and 2 Servicing and Testing
Model Numbers: 32-29-2550CE and 32-29-2550AU

(Doc Ref:SVR:HO:NEA:TRA:LSR Specs 15/1/2001 9 pages)

Equipment Required:

- Calibrated pressure gauge (Part Number 59-L89T100 or 59-T300),
- Calibrated flow meters (Part Number 59-L89T100 or 59-T300),
- Regulated supply (Part Number 59-320 or 59-L89T101),
- Pressure relief adaptor hose (Part Number 59-321),
- Oxygen or Clean dry, oil free air supply,
- Specifications document (Part Number 59-053),
- Tools Required,
- 8mm spanner,
- 9/64 Hex key,
- Tooth brush,
- Fine point tweezers,
- AS Self Seal Outlet Assembly Tool (Part Number 59-562) and
- AS SSO Assembly Tool Spacer (Part Number 59-562-01).

Consumables Required:

- Oxygen Safe cleaning fluid (Part Number 59-200-11),
- Oxygen safe leak detector (Part Number 59-200-36),
- Oxygen safe sealing tape (Part Number 59-200-59),
- Lint free cloth (Part Number 58-450-01),
- Krytox oxygen safe lubricant (Part Number 59-200-93) and
- Loctite Type 567 (Part Number 59-200-38).

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Oxygen Regulator Servicing & Testing

The Laser Spectrum Regulator.

The LSR Regulator has been in service since 1998.

The regulator has been supplied in two types:

- Type 1 with Part Number 32-29-2550-CE and
- Type 2 with Part Number 32-29-2550-AU.

Type 1 (Part Number: 32-29-2550-CE)

Specifications:

- Body Pressure: 275 - 414 kPa
- Supply Pressure: 2760 – 20700 kPa
- Flow rate: .5, 1, 2, 4, 6, 8, 10, 12,15, 20,25 litres/min.
- High Pressure Outlet Flow 100+ litres/min.
- Safety Relief Valve 517 to 700 kPa

Materials:

- Body: Brass
- Pistons: Brass
- Seat: High Temp Teflon
- Inlet: Brass
- Inlet Filter: 25 micron sintered bronze
- Spring: Stainless Steel
- Flow Control Disc: Brass
- Flow Control Body: Brass
- Flow Control Knob: Aluminium
- Outlets: Brass
- Gauge: kPa Scale Safety Pattern

Type 2 (Part Number: 32-29-2550-AU)

Specifications:

- Body Pressure: 332 - 470 kPa
- Supply Pressure: 2760 – 20700 kPa
- Flow rate: .5, 1, 2, 4, 6, 8, 10, 12,15, 20,25 litres/min.
- High Pressure Outlet Flow 100+ litres/min.
- Safety Relief Valve 517 to 700 kPa

Materials:

- Body: Brass
- Pistons: Brass
- Seat: High Temp Teflon
- Inlet: Brass
- Inlet Filter: 25 micron sintered bronze
- Spring: Stainless Steel
- Flow Control Disc: Brass
- Flow Control Body: Brass
- Flow Control Knob: Aluminium
- Outlets: Brass
- Gauge: kPa Scale Safety Pattern

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Oxygen Regulator Servicing & Testing

Test Procedure

This procedure tests for leaks and pressure and flow accuracy.

WARNING

* Testing of pressurised equipment has inherent dangers ranging from dust being blow in eyes, to explosions and fire.

Wear appropriate safety equipment when testing.

All tools must be absolutely free from grease and oil (hydrocarbons), and very clean. Work surfaces must be clean, and free from all hydrocarbons and even dust.

Wipe down all surfaces before working on each piece of equipment. Use only approved parts.

Use only calibrated approved testing devices and tools.

1/. Inspect the regulator for cleanliness and damage.

- Remove any built up grime, check inlet is clean and clear of debris. If the inlet is dirty see section on inlet filter changing. (Dismantling Section 14),
- Any major damage, which places the units structural integrity in doubt, do not test, condemn the unit and advise the owner,
- Damage to the gauge requires the upmost care when testing prior to dismantling, consider changing the gauge first or condemning the regulator. When testing with a damaged gauge treat the gauge as though it will suddenly fail and
- Remove aspirator and bag refill valve hoses at the hand wheels screwed onto the outlets of the regulator. Remove any therapy hoses, remove regulator from soft bag.

2/. Install regulator on pressure source (Pin indexed for Oxygen) and test for leaks.

- If installing on a cylinder, inspect cylinder outlet for dust and debris, consider blowing out the cylinder valve by pointing the outlet away from you and slowly opening the cylinder allowing some gas to escape into free air,
- Always open the regulator flow control knob to allow pass through of gas,
- Never face the gauge of any regulator being pressurised. Move or point the gauge away from you. Expect failure and you will be much safer and
- Use a source with a pressure no less than 15000 kPa.

3/. Test for Leaks.

- Attach test pressure gauge to HP outlet,
- Open cylinder valve S-L-O-W-L-Y,
- Observe gauge, close cylinder valve and watch for pressure fall,
- Allow reg to stay attached to closed valve for three minutes, note needle position on both gauges, then reopen cylinder valve S-L-O-W-L-Y and note if needle moves, indicating loss of pressure and
- If pressure dropped use O2 safe leak detector (Part Number 59-200-36) to identify leak. Repair any leak (see below procedures).

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Oxygen Regulator Servicing & Testing

4/. Test flows from the therapy outlet.

They should be within the following chart.

Copyright: RAPP Australia Pty Ltd 15/01/1999		
Accuracy required for regulators with fixed orifices as per AS 3840.1-1998		
Clause 9.4.2		
Inlet pressure between 20000 and 2000 kPa		
	Min	Max
0.50	0.45	0.60
1	0.85	1.15
2	1.70	2.30
4	3.40	4.60
6	5.10	6.90
8	6.80	9.20
10	8.50	11.50
12	10.20	13.80
15	12.80	17.30
20	17.00	23.00
25	21.30	28.80

The above scale is in accordance with AS 3940.1 1998. Flow rates accuracy:

- Flows above 1 litre/min. +/- 15%.
- Below 1 litre/min. +20%, -10%

5/. Test body pressure.

- Connect calibrated pressure gauge to HP self seal outlet and check body pressure ensure pressure is within specification and
- Test body pressure with therapy outlet open to 25 litres per minute.

6/. Test High Pressure outlet flow.

- Ensure the unit flows at least 100 litres per minute from HP outlets.

7/. Place regulator on a pin indexed post valve and leave shut.

Apply increasing pressure from test regulator (Part Number 59-320 & Part Number 59-321) increasing up to 700 kPa to HP inlet and observe when pressure relief activates.

Please Note: Complete all tests 4 through to 7 prior to commencing trouble shooting unless the regulator is unsafe.

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Oxygen Regulator Servicing & Testing

Trouble Shooting Guide

Note: This is not an exhaustive list, use as a guide only.

Problem	Possible Cause	Possible Remedy
Flows Too Low Or High On All Settings	Body pressure incorrect	Insert shim to raise pressure, remove to lower.
	Cylinder/supply pressure too low	Change oxygen source
	Flow label moved	Remove control knob and apply new sticker.
	Clogged flow controller	Replace flow controller or clean
Unit Continuously Flow / Leaks Through Therapy Barb	Inner "O" ring on flow control unit leaking	Replace "O" ring
	No lubricant in contact with flow controller "O" rings.	Clean and relubricate with Krytox
Body Pressure Too High	Cylinder pressure too low	Change cylinder
	Worn seat	Replace piston set
	Too many shims	Reduce shims
	Incorrect/damaged spring	Change spring
	Incorrectly assembled	Reassemble
Outlet Pressure Creeps Up	Worn seat	Replace Piston
Body Pressure Too Low	Cylinder pressure too low	Change cylinder
	Spring worn	Replace spring or shim
	Shims missing	Replace shim
Constant Leak From Pressure Relief Outlet	Dislodged Viton washer	Replace pressure relief piston
	Defective piston "O" rings.	Replace piston
Leak from Within Gauge	Ruptured bourdon tube	Replace gauge
Leak From Around Inlet Stem Seal	Incorrect seal used	Fit Stat-O-Seal
	Inlet stem loose	Change filter and tighten
Safety Relief Valve Opens at Incorrect Pressure	Spring Worn	Replace spring

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Oxygen Regulator Servicing & Testing

Dismantling the LSR

Prepare work space, ensure it is clean and free of any contaminants,

Ensure you have a dismantling space, a cleaning area and an assembly area. Wear appropriate safety equipment such as safety glasses, gloves etc.

The procedure outlined here is in a suggested order. Depending on circumstances the order may be changed. However, the procedures should be followed and the correct tools used.

If safe to do so it is recommended that all specifications are tested prior to any dismantling action.

Note: Section 1 should only be done for body cleaning or to repair leaks, leave DISS outlets in place unless they need to be removed

1. Remove extension hose assembly. Dismantle and repair if required.
Inspect DISS tail piece "O" ring and replace assembly (Part Number 59-001-2-98) if damaged or leaking.
Remove self seal outlets using 7/16th spanner, clean threaded orifice, removing sealing tape debris and any metal remnants, vent through using air attached to the pin indexed inlet of the regulator ensuring you wear safety glasses, do not look at the outlet when venting out.
Note: Section 2 should only be done for body cleaning or to replace damaged gauge. Leave gauge in place unless required to be removed.
2. Remove gauge with 12mm or 14mm spanner, clean threaded orifice, removing sealing tape debris, vent through using air attached to the pin indexed inlet of the regulator ensuring you wear safety glasses, do not look at the outlet when venting out.
3. Holding the regulator so that the T handle is facing towards the floor, unscrew and remove the T handle, inspect for debris and clean out if required.
4. Holding the outlet towards the floor, insert 9/64ths hex key and remove inlet and filter. If the filter is stubborn tap body onto table to "shock" the filter out. Normally the filter should be changed if the reg has been in service for longer than 3 months. Inspect the inlet and clean or replace if necessary (Part Number 55-dsdsd-11). We recommend changing the filter on a regular basis determined according to usage and cleanliness of unit.
5. Remove therapy outlet barb outlet with 9/16th spanner. Remove debris from thread on barb and hole.
6. Remove flow controller assembly by unscrewing via the adjustment knob. Inspect "O" rings and replace if necessary.
7. Remove pressure control piston, shims, spring and pressure relief piston. Keep together, do not mix parts with parts from other sets. Inspect and replace if necessary. Consider replacing pressure control piston with seat every 4 years.
8. Inspect body internally for cleanliness and decide if full cleaning is required. If you have cleaning facilities do so, or send to RAPP Australia Pty Ltd.

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Oxygen Regulator Servicing & Testing

Disassembly of AS Self Seal Outlets

Note: If special tools are not available, supply new unit (Part number 59-562)
Inspect and clean AS SSO assembly tool (Part Number 59-562).

1. Wind locking nut fully in and then back off 2 full turns,
2. Install Disassembly spacer (Part Number 59-562-01),
3. Screw on AS SSO assembly into threaded receiver,
4. Tighten locking nut to firm,
5. Undo AS SSO with 25mm spanner and
6. Remove "O" rings.

Reassembly of LSR

1. Ensure all external and internal parts are cleaned for oxygen service, ensure work area is clean and wiped down, ensure assemblers hands and clothes are clean and free from oils and grease. Wear appropriate safety items.
2. Install filter and inlet stem.
3. Lubricate internal pressure chamber of regulator body with a thin film of Krytox. Pay attention to therapy barb hole. on the threaded section of the body.
4. Apply a thin film of Krytox to the "O" rings of piston and pressure relief valve. Bench assemble the piston set and install ensuring pressure relief piston is flush against the end wall of high pressure chamber. Make sure the "Stack" is well aligned. Keep holding with "T" handle threaded hole pointing downwards.
5. Install new flow controller with "O" rings if necessary (2 x Part Number 55-xx). Install flow control assembly, aligning therapy outlet barb hole with the threaded hole in the flow controller assembly body.
6. Install therapy barb with 9/16th spanner using oxygen safe tape (Part Number 59-200-59)
7. Install "T" handle.
8. Blow out HP outlets by attaching reg to gas source and gently turning on source for a brief period, do not look at the outlets whilst blowing out.
9. On Type 2 regulators install DISS outlets using oxygen safe tape.
10. On Type 1 regulators install hose using O clips (Part Number 59-100-53-1802) and self seal outlets.
11. Test Regulator as per test procedure.

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Assembly of AS Self Seal Outlets:

Note: If special tools are not available, supply new unit (Part number 59-013)

1. Inspect and clean AS SSO assembly tool (Part Number 59-562).
2. Wind locking nut fully in.
3. Ensure Disassembly spacer (Part Number 55-562-01) is **not** installed
4. Screw on AS SSO threaded shaft, mount tool in holding device such as a vice with threaded shaft upper most.. Ensure locking nut is accessible
5. Install "O" ring (Part Number 59-008) on Centre shut of plunger
6. Insert centre shut off plunger with "O" ring upper most into threaded shaft.
7. Install "O" ring (Part Number 59-012) into receiver grove of AS SSO main body.
8. Place small drop of Loctite (Part Number 59-200-38) onto mid section of exposed thread of threaded shaft.
9. Screw AS SSO body onto threaded shaft and tighten.
10. Undo locking nut, remove AS SSO from assembly tool, inspect and test for gas tightness.

Spare Parts List: Laser Spectrum Regulator

ID Number	Part Number	Description
4,5,5a,6 & 6a	55-901-19-04	SLR 32-29-2550-CE Pistons and Spring Kit
2	55-901-19-05	SLR CE Flow Control
4,5,5a,6 & 6a	55-901-20-04	SLR 32-29-2550-AU Pistons and Spring Kit
2	55-901-20-04	SLR 32-29-2550-AU Flow Control
9	55-901-20-07	SLR Gauge
7	55-901-20-08	SLR T Handle
11	55-901-20-10	SLR Barbed Outlet
20,15	55-901-20-11	SLR Inlet Kit
Not shown	55-901-20-12	SLR DISS Self Seal Outlet
3	55-901-20-13	SLR Flow control knob
10	55-901-20-14	SLR O ring flow controller
Not shown	59-008	AS SSO Centre plunger "O" ring
Not shown	59-012	AS SSO Body "O" ring
18	59-100-53-1802	O Clip
13	55-901-02	Stat-O-Seal
10	59-013	AS SSO Assembly

Parts List 01/05/2001

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Oxygen Regulator Servicing & Testing

LSR Type 1 and 2 Specifications

Type 1:

Part Number 32-29-2550CE

- Body Pressure: 275 - 414 kPa (P2 400 kPa)
- Supply Pressure: 2760 – 20700 kPa (P1 20000 kPa)
- Flow rate: .5, 1, 2, 4, 6, 8, 10, 12,15, 20,25 litres/min.
- High Pressure Outlet Flow 100+ litres/min. (Q1 25l/min)
- Safety Relief Valve 517 to 690 kPa

Materials:

- Body: Brass
- Pistons: Brass
- Seat: High Temp Teflon
- Inlet: Brass
- Inlet Filter: 25 micron sintered bronze
- Spring: Stainless Steel
- Flow Control Disc: Brass
- Flow Control Body: Brass
- Flow Control Knob: Aluminium
- Outlets: Brass
- Gauge: kPa Scale Safety Pattern
- Type 2: Part Number 32-29-2550AU
- Body Pressure: 332 - 470 kPa (P2 400 kPa)
- Supply Pressure: 2760 – 20700 kPa (P1 20000 kPa)
- Flow rate: .5, 1, 2, 4, 6, 8, 10, 12,15, 20,25 litres/min.
- High Pressure Outlet Flow 100+ litres/min. (Q1 25l/min)
- Safety Relief Valve 545 to 720 kPa

Materials:

- Body: Brass
- Pistons: Brass
- Seat: High Temp Teflon
- Inlet: Brass
- Inlet Filter: 25 micron sintered bronze
- Spring: Stainless Steel
- Flow Control Disc: Brass
- Flow Control Body: Brass
- Flow Control Knob: Aluminium
- Outlets: Brass
- Gauge: kPa Scale Safety Pattern

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Copyright: RAPP Australia Pty Ltd 15/01/1999		
Accuracy required for regulators with fixed orifices as per AS 3840.1-1998		
Clause 9.4.2		
Inlet pressure between 2000 and 2000 kPa		
	Min	Max
0.50	0.45	0.60
1	0.85	1.15
2	1.70	2.30
4	3.40	4.60
6	5.10	6.90
8	6.80	9.20
10	8.50	11.50
12	10.20	13.80
15	12.80	17.30
20	17.00	23.00
25	21.30	28.80

Laser Spectrum Regulator

Type 3 Servicing and Testing

Model Numbers 32-29-2550ASTL, 32-29-3550AU or 32-29-2502AU

(Doc Ref:SVR:HO:NEA:TRA:LSR3 Specs 05/07/2005 8 pages)

Equipment Required

Calibrated Pressure Gauge	(Part Number 59-L89T100 or 59-T300)
Calibrated Flow Meters	(Part Number 59-L89T100 or 59-T300)
Regulated Supply	(Part Number 59-320 or 59-L89T101)
Pressure Relief Adaptor Hose	(Part Number 59-321)
Oxygen or Clean dry, oil free air supply.	
Specifications document	(Part Number 59-053)

Tools Required

9/64 Hex key	
Tooth Brush	
Fine Point Tweezers	
As Self Seal Outlet Assembly Tool	(Part Number 59-562)
As Sso Assembly Tool Spacer	(Part Number 59-562-01)
Spring Compression Tool	(Part Number 59-L81 T73)
Compressing Circlip Pliers	

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Oxygen Regulator Servicing & Testing

Consumables Required:

Oxygen Safe cleaning fluid	(Part Number 59-200-11)
Oxygen safe leak detector	(Part Number 59-200-36)
Oxygen safe sealing tape	(Part Number 59-200-59)
Lint free cloth	(Part Number 58-450-01)
Krytox oxygen safe lubricant	(Part Number 59-200-93)
Loctite Type 567	(Part Number 59-200-38)

The Laser Spectrum Regulator.

The pin indexed regulator has been supplied in 3 types.

Type 1 with Part Number:	32-29-2550-CE
Type 2 with Part Number:	32-29-2550-AU
Type 3 with Part Number:	32-29-2550-ASTL and 32-29-2502-ASTL

Specifications:

Type 3 Part Number:	32-29-2550-ASTL and 32-29-2502-AU
Body Pressure:	332 - 470 kPa
Supply Pressure:	2760 – 20700 kPa
Flow rate:	0.5, 1, 2, 4, 6, 8, 10, 12,15, 20,25 litres/min.
High Pressure Outlet Flow:	100+ litres/min.
Safety Relief Valve:	517 to 700 kPa

Materials:

Body:	Brass
Pistons:	Brass
Seat:	High Temp Teflon
Inlet:	Brass
Inlet Filter:	25 micron sintered bronze
Spring:	Stainless Steel
Flow Control Disc:	Brass
Flow Control Body:	Brass
Flow Control Knob:	Aluminium
Outlets:	Brass
Gauge:	kPa Scale Safety Pattern

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Oxygen Regulator Servicing & Testing

Test Procedure

This procedure tests for leaks and pressure and flow accuracy.

WARNING

* Testing of pressurised equipment has inherent dangers ranging from dust being blow in eyes, to explosions and fire.

Wear appropriate safety equipment when testing.

All tools must be absolutely free from grease and oil (hydrocarbons), and very clean. Work surfaces must be clean, and free from all hydrocarbons and even dust.

Wipe down all surfaces before working on each piece of equipment. Use only approved parts.

Use only calibrated approved testing devices and tools.

1/. Inspect the regulator for cleanliness and damage.

- Remove any built up grime, check inlet is clean and clear of debris. If the inlet is dirty see section on inlet filter changing. (Dismantling Section 14),
- Any major damage, which places the units structural integrity in doubt, do not test, condemn the unit and advise the owner,
- Damage to the gauge requires the upmost care when testing prior to dismantling, consider changing the gauge first or condemning the regulator. When testing with a damaged gauge treat the gauge as though it will suddenly fail and
- Remove aspirator and bag refill valve hoses at the hand wheels screwed onto the outlets of the regulator. Remove any therapy hoses, remove regulator from soft bag.

2/. Install regulator on pressure source (Pin indexed for Oxygen) and test for leaks.

- If installing on a cylinder, inspect cylinder outlet for dust and debris, consider blowing out the cylinder valve by pointing the outlet away from you and slowly opening the cylinder allowing some gas to escape into free air,
- Always open the regulator flow control knob to allow pass through of gas,
- Never face the gauge of any regulator being pressurised. Move or point the gauge away from you. Expect failure and you will be much safer and
- Use a source with a pressure no less than 15000 kPa.

3/. Test for Leaks

- Attach test pressure gauge to HP outlet,
- Open cylinder valve S-L-O-W-L-Y,
- Observe gauge, close cylinder valve and watch for pressure fall,
- Allow reg to stay attached to closed valve for three minutes, note needle position on both gauges, then reopen cylinder valve S-L-O-W-L-Y and note if needle moves, indicating loss of pressure and
- If pressure dropped use O2 safe leak detector (Part Number 59-200-36) to identify leak. Repair any leak (see below procedures).

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- 4/. **Test flows from the therapy outlet.**
They should be within the following chart.

Copyright: RAPP Australia Pty Ltd 15/01/1999		
Accuracy required for regulators with fixed orifices as per AS 3840.1-1998		
Clause 9.4.2		
Inlet pressure between 20000 and 2000 kPa		
	Min	Max
0.50	0.45	0.60
1	0.85	1.15
2	1.70	2.30
4	3.40	4.60
6	5.10	6.90
8	6.80	9.20
10	8.50	11.50
12	10.20	13.80
15	12.80	17.30
20	17.00	23.00
25	21.30	28.80

The above scale is in accordance with AS 3940.1 1998. Flow rates accuracy:

- Flows above 1 litre/min. +/- 15% and
- Below 1 litre/min. +20%, -10%.

5/. **Test body pressure.**

- Connect calibrated pressure gauge to HP self seal outlet and check body pressure ensure pressure is within specification and
- Test body pressure with therapy outlet open to 25 litres per minute.

6/. **Test High Pressure outlet flow.**

- Ensure the unit flows at least 100 litres per minute from HP outlets.

- 7/. Place regulator on a pin indexed post valve and leave shut. Apply increasing pressure from test regulator (Part Number 59-320 & Part Number 59-321) increasing up to 700 kPa to HP inlet and observe when pressure relief activates.

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Oxygen Regulator Servicing & Testing

Complete all tests 4 through to 7 prior to commencing
trouble shooting unless the regulator is unsafe.

Trouble Shooting Guide

Note: This is not an exhaustive list, use as a guide only.

Problem	Possible Cause	Possible Remedy
Flows Too Low Or High On All Settings	Body pressure incorrect	Insert shim to raise pressure, remove to lower.
	Cylinder/supply pressure too low.	Change oxygen source.
	Flow label moved.	Remove control knob and apply new sticker.
	Clogged flow controller.	Replace flow controller or clean.
Unit Continuously Flow/Leaks Through Therapy Barb.	Inner "O" ring on flow control unit leaking.	Replace "O" ring.
	No lubricant in contact with flow controller "O" rings.	Clean and relubricate with Krytox.
Body Pressure Too High	Cylinder pressure too low.	Change cylinder.
	Worn seat.	Replace piston set
	Too many shims.	Reduce shims.
	Incorrect/damaged spring	Change spring.
	Incorrectly assembled	Reassemble.
Outlet Pressure Creeps Up	Worn seat.	Replace Piston.
Body Pressure Too Low	Cylinder pressure too low.	Change cylinder.
	Spring worn.	Replace spring or shim.
	Shims missing.	Replace shim.
Constant Leak From Pressure Relief Outlet	Dislodged Viton washer.	Replace pressure relief piston.
	Defective piston "O" rings.	Replace piston
Leak From Within Gauge.	Ruptured bourdon tube.	Replace gauge.
Leak From Around Inlet Stem Seal.	Incorrect seal used.	Fit Stat-O-Seal.
	Inlet stem loose.	Change filter and tighten.
Safety Relief Valve Opens At Incorrect Pressure.	Spring Worn.	Replace spring.

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Oxygen Regulator Servicing & Testing

Dismantling the LSR Type 3

Prepare work space, ensure it is clean and free of any contaminants,

Ensure you have a dismantling space, a cleaning area and an assembly area. Wear appropriate safety equipment such as safety glasses, gloves etc.

The procedure outlined here is in a suggested order. Depending on circumstances the order may be changed. However, the procedures should be followed and the correct tools used.

If safe to do so it is recommended that all specifications are tested prior to any dismantling action.

1. If necessary remove gauge with 12mm or 14mm spanner, clean threaded orifice, removing sealing tape debris, vent through using air attached to the pin indexed inlet of the regulator ensuring you wear safety glasses, do not look at the outlet when venting out.
2. Holding the regulator so that the T handle is facing towards the floor, unscrew and remove the T handle, inspect for debris and clean out if required.
3. Holding the outlet towards the floor, insert 9/64ths hex key and remove inlet and filter. If the filter is stubborn tap body onto table to "shock" the filter out. Normally the filter should be changed if the reg has been in service for longer than 3 months.
Inspect the inlet and clean or replace if necessary (Part Number 55-901-20-11). We recommend changing the filter on a regular basis determined according to usage and cleanliness of unit.
4. Remove therapy outlet barb outlet with suitable spanner. Remove debris from thread on barb and hole.
5. Remove flow controller assembly by undoing phillips head screw, remove carefully as there is a small spring and plunger under flow knob.
6. The flow assembly should be compressed using compression tool Part Number 59-L81T73. Only slight down ward movement of the flow assembly is required.
Use quality circlip pliers to compress the circlip and remove. Remove the flow controller assembly and inspect, take care not to lose components under the flow controller.
7. Remove pressure control piston, shims, spring and pressure relief piston. Keep together, do not mix parts with parts from other sets.
Inspect and replace if necessary. Consider replacing pressure control piston with seat if damaged.
8. Inspect body internally for cleanliness and decide if full cleaning is required. If you have cleaning facilities do so, or send to RAPP Australia Pty Ltd.

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Oxygen Regulator Servicing & Testing

Reassembly of LSR Type 3.

1. Ensure all external and internal parts are cleaned for oxygen service, ensure work area is clean and wiped down, ensure assemblers hands and clothes are clean and free from oils and grease. Wear appropriate safety items.
2. Install filter and inlet stem.
3. Lubricate internal pressure chamber of regulator body with a thin film of Krytox or suitable oxygen safe lubricant.
4. Apply a thin film of Krytox to the "O" rings of piston and pressure relief valve. Bench assemble the piston set and install ensuring pressure relief piston is flush against the end wall of high pressure chamber. Make sure the "Stack" is well aligned. Keep holding with "T" handle threaded hole pointing downwards.
5. Install flow controller with "O" rings if necessary. Install flow control assembly, aligning therapy outlet barb hole with the threaded hole in the flow controller assembly body. Use compression tool and install circlip with sharp edges upper most.
6. Install therapy barb using oxygen safe tape (Part Number 59-200-59).
7. Install filter, Inlet orifice, new stat-o-seal, and "T" handle.
8. Test Regulator as per test procedure.

Spare Parts List

Laser Spectrum Regulator Type 3

ID Number	Part Number	Description
4,5,6 & 6a	55-901-29-04	LSR 32-29-2550-AUSTL Pistons and Spring Kit
12	55-901-29-05	Shim Size 1
12	55-901-29-06	Shim Size 2
2	55-901-29-04	LSR 32-29-2550-AUSTL Flow Control 0-25l/m
	55-901-29-15	LSR 32-29-2550-AUSTL Flow Control 0-8&15l/m
9	55-901-29-07	LSR Gauge
7	55-901-29-08	LSR T Handle
11	55-901-29-10	LSR Barbed Outlet
20	55-901-29-11	LSR Inlet filter
3	55-901-29-13	LSR Flow control knob
10	55-901-29-14	LSR O ring flow controller
Not Shown	59-008	AS SSO Centre plunger "O" ring
Not Shown	59-012	AS SSO Body "O" ring
13	55-901-02	Stat-O-Seal
21	59-013	AS SSO Assembly

Parts List 01/05/2001

Allied Laser Spectrum

Oxygen Regulator Servicing & Testing

LSR Type 3 Specifications

Type 2: Part Number	32-29-2550AUSTL	
Body Pressure:	332 - 470 kPa	(P2 400 kPa)
Supply Pressure:	2760 – 20700 kPa	(P1 20000 kPa)
Flow rate:	0.5, 1, 2, 4, 6, 8, 10, 12,15, 20, 25 litres/min.	
High Pressure Outlet Flow	100+ litres/min.	(Q1 25l/min)
Safety Relief Valve	545 to 720 kPa	

Materials:

Body:	Brass
Pistons:	Brass
Seat:	High Temp Teflon
Inlet:	Brass
Inlet Filter:	25 micron sintered bronze
Spring:	Stainless Steel
Flow Control Disc:	Brass
Flow Control Body:	Brass
Flow Control Knob:	Aluminium
Outlets:	Brass
Gauge:	kPa Scale Safety Pattern

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Accuracy required for regulators with fixed orifices as per AS 3840.1-1998		
Clause 9.4.2		
Inlet pressure between 20000 and 2000 kPa		
	Min	Max
0.50	0.45	0.60
1	0.85	1.15
2	1.70	2.30
4	3.40	4.60
6	5.10	6.90
8	6.80	9.20
10	8.50	11.50
12	10.20	13.80
15	12.80	17.30
20	17.00	23.00
25	21.30	28.80